

WHAT IS CLAIMED IS:

1 1. A method of making a camera module, comprising:
2 providing a sensor housing comprising an image sensor, a lens holder
3 comprising a lens, and a deformable focus adjustment structure; and
4 deforming the focus adjustment structure to move the lens whereby light is
5 focused onto the image sensor.

1 2. The method of claim 1, wherein the focus adjustment structure
2 comprises a material shrinkable in response to energy, and deforming the focus
3 adjustment structure comprises applying energy to at least some of the shrinkable
4 material.

1 3. The method of claim 2, wherein the focus adjustment structure
2 comprises heat shrink material, and deforming the focus adjustment structure
3 comprises heating at least some of the heat shrink material.

1 4. The method of claim 3, wherein at least some of the heat shrink
2 material is heated by contact with a heating element.

1 5. The method of claim 3, wherein at least some of the heat shrink
2 material is heated by radiant energy.

1 6. The method of claim 5, wherein at least some of the heat shrink
2 material is heated by laser energy.

1 7. The method of claim 2 wherein the shrinkable material is disposed
2 uniformly about an optical axis of the lens.

1 8. The method of claim 7, wherein energy is applied uniformly to the
2 uniformly disposed shrinkable material to reduce a distance separating the lens
3 and the image sensor.

1 9. The method of claim 7, wherein energy is applied asymmetrically to
2 the uniformly disposed shrinkable material to adjust where the optical axis
3 intersects the image sensor.

1 10. The method of claim 2, further comprising guiding the lens holder
2 while applying energy to at least some of the shrinkable material.

1 11. The method of claim 1, wherein the lens holder is a monolithic
2 structure.

1 12. The method of claim 1, wherein the lens holder and the sensor
2 housing are formed as a single molding of thermoplastic material.

1 13. A system for making a camera module, comprising:
2 a camera module holder operable to hold a camera module comprising an
3 image sensor disposed within a sensor housing and a lens holder attached to the
4 sensor housing, the lens holder comprising a lens and a deformable focus
5 adjustment structure; and
6 a focus adjuster operable to deform the focus adjustment structure to move
7 the lens whereby light is focused onto the image sensor.

1 14. The system of claim 13, wherein the focus adjustment structure
2 comprises a material shrinkable in response to energy, and the focus adjuster is
3 operable to apply energy to at least some of the shrinkable material.

1 15. The system of claim 14, wherein the focus adjustment structure
2 comprises heat shrink material, and the focus adjuster is operable to heat at least
3 some of the heat shrink material.

1 16. The system of claim 15, wherein the focus adjuster comprises a
2 heating element operable for heating at least some of the heat shrink material.

1 17. The system of claim 15, wherein the focus adjuster comprises a
2 radiant energy source for heating at least some of the heat shrink material.

1 18. The system of claim 17, wherein the focus adjuster comprises a
2 laser for heating at least some of the heat shrink material with laser energy.

1 19. The system of claim 14 wherein the shrinkable material is disposed
2 uniformly about an optical axis of the lens and the focus adjuster is operable to

3 uniformly apply energy to the uniformly disposed shrinkable material to reduce a
4 distance separating the lens and the image sensor.

1 20. The system of claim 14 wherein the shrinkable material is disposed
2 uniformly about an optical axis of the lens and the focus adjuster is operable to
3 asymmetrically apply energy to the uniformly disposed shrinkable material to
4 adjust where the optical axis crosses the image sensor.

1 21. A camera module, comprising:
2 an image sensor disposed within a sensor housing;
3 a lens holder comprising a lens; and
4 a focus adjustment structure disposed between the lens holder and the
5 sensor housing, wherein the focus adjustment structure is deformed whereby light
6 passing through the lens is focused onto the image sensor.

1 22. The camera module of claim 21, wherein the lens holder and the
2 focus adjustment structure are sections of a monolithic structure, the lens holder
3 and the focus adjustment structure comprising regions of material with similar
4 chemical compositions but different internal structural arrangements.

1 23. The camera module of claim 22, wherein at least one region of the
2 focus adjustment structure corresponds to a deformed version of a region of the
3 lens holder.

1 24. The camera module of claim 22, wherein the at least one region of
2 the focus adjustment structure corresponds to a heat shrunk version of a heat
3 shrinkable region of the lens holder.

1 25. The camera module of claim 22, wherein the monolithic structure is
2 formed of a thermoplastic material and the focus adjustment structure and the
3 lens holder are characterized by different respective cross-linking densities.

1 26. The camera module of claim 21, wherein the lens holder comprises
2 an exterior deformation inhibiting layer and the focus adjustment structure is free
3 of any exterior deformation inhibiting layer.

1 27. The camera module of claim 26, wherein the exterior deformation
2 inhibiting layer is substantially thermally conductive.

1 28. The camera module of claim 26, wherein the exterior deformation
2 inhibiting layer is substantially reflective of radiation capable of deforming at least
3 some regions of the lens holder.

1 29. The camera module of claim 21, wherein the lens holder, the focus
2 adjustment structure, and the sensor housing are formed as a single molding of
3 thermoplastic material.